<<可变重力条件下神经元系统中的自组织>>

图书基本信息

书名：<<可变重力条件下神经元系统中的自组织和斑图动力学>>

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内容概要

Sciences Under Space Conditions describes the interaction of gravity with neuronal systems. To deliver the basic scientific and technological background， the structures of neuronal systems are described and platforms for gravity research are presented. The book is rounded off by information about the interaction of chemical model systems with gravity and some simulations， and results about the interaction of gravity with neuronal systems from single molecules to the entire human brain are demonstrated. This is the first book to give a complete overview about neurophysiological research under conditions of variable gravity.　　The book is intended for scientists in the field of space research, neurophysiology, and those who are interested in the control of non-linear systems by small external forces.

作者简介

Dr. Meike Wiedemann and Dr. Florian P.M. Kohn are Biological Scientists in the Lab of Membranephysiology at the University of Hohenheim, Germany and have been working in the field of life sciences under space condition for some years. Prof. Harald Roesner has been working in the field of Neurophysiology and is now retired. Prof. Wolfgang R.L. Hanke is the leader of the Department of Membranephysiology at the University of Hohenheim.

书籍目录

章节摘录

The question, which can be the cellular and further consequences of a higher open state probability is not that simple to be answered and will depend on the ion-channel under investigation. Up to now, only data for some specialized cases （model systems） are available, which are not to be applied to neuronal systems. However, let us speculate about the membrane of a neuron, having at least potassium channels to give the resting membrane potential and sodium channel to en- able action potentials （Hille, 1992; Weiss, 1997）. The sodium channels are closed at rest; the potassium channels are permanently open at a non-zero open state probability. In a simplified discussion, closed sodium-channels would not be affected by gravity as the gating mechanism is of electrical nature, a depolarization of membrane across a threshold value. However, potassium channels as being open anyhow, would react to gravity changes, applying microgravity would lower their open state probability. Having the Goldman equation in mind （Weiss, 1997） this would lead to a membrane depolarization. As long as the threshold for sodium channels is not reached, no action potentials would be elicited, but further stimulation would more easily give an action potential.　　The next set of experiments which has to be taken into account then is those with spontaneously spiking neurons. A prediction from the above statements （speculations） would be that in this case the spike frequency should be higher at microgravity. Just that has been shown. Also, a direct measurement of membrane potential should result in less negative values. In the experiments utilizing voltage sensitive dyes accurately this has been shown. According to textbook knowledge （Hille, 1992）, at depolarization of membrane potential, voltage sensitive calcium channels open in the cell membrane, calcium enters the cell, and the intracellular calcium concentration increases. This could not be verified, in some experiments instead it was shown that the intracellular calcium level at microgravity drops （see above）. As the intracellular calcium concentration is a highly regulated value, this could be due to secondary effects, but will have again to be investigated more deeply.